DOCUMENT RESUME

ED 291 663 SO 018 869

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TITLE Community Mapping: Developing A Geographic Perspective.
PUB DATE 88
NOTE 9p.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Census Figures; Community; Community Characteristics; Geographic Distribution; *Geography; *Geography Instruction; Human Geography; Maps; Map Skills; Social Studies; Statistical Data; Teaching Methods
IDENTIFIERS *Choropleth Maps; *Scattergrams

ABSTRACT

Choropleth maps and scattergrams (scatter diagrams) provide a way for teachers to use available statistics from census tracts to map area differences among neighborhoods. This document describes and illustrates a method of constructing and comparing choropleth maps for selected Iowa communities. The use and construction of scatter diagrams as a supplement to map comparison is also discussed. The choropleth map uses different shaded area symbols (normally ranging from black to light grey) to show distributional patterns. Selected colors should be within the same family, such as brown, red, orange, and yellow. Steps in constructing the map are to: (1) determine the area unit to be used; (2) select the statistics to be mapped; (3) select an appropriate categorization method such as quantile method or equal interval method; (4) group the statistics into four or five classes; and (5) use the darkest symbols for areas with greater magnitude. A method of visually showing the relationship between two variables for a selected number of observations is the scattergram which also can be easily constructed. The document concludes with a listing of statistical sources for mapping local areas. (SM)

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COMMUNITY MAPPING:

DEVELOPING A GEOGRAPHIC PERSPECTIVE

by

James F. Frymon

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COMMUNITY MAPPING: DEVELOPING A GEOGRAPHIC PERSPECTIVE

INTRODUCTION

Too often students, teachers, and the general public are not always aware of social, economic, and political variations between areas within their community. An excellent way to define areal differences among neighborhoods is to map available statistics for census tracts, precincts, etc. Statistics are relatively plentiful to permit the mapping of numerous topics such as crime rates, political affiliation, social differences, and economic levels. Once topics are mapped they can be compared with each other to determine if there are apparent associations between patterns. For example a question such as "Are high crime areas also areas of high unemployment?" could be determined by creating two maps: a crime map and a map of unemployment. These maps could then be visually compared to see if associations exist. In addition to map comparisons, scattergrams can bey employed to determine possible associations.

This presentation will focus on describing how to construct and compare choropleth maps for selected Iowa communities. In addition the use and construction of scatter diagrams as a supplement to map comparisons will be discussed. Mapping sources at the census tract, precinct, and crime zone level will also be cited.

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THE CHOROPLETH MAP

Perhaps one of the most valuable and widely used thematic maps available to social science teachers is the choropleth map. This map uses different shaded area symbols to show distributional patterns. Normally the area symbols range from black (indicating a lot of something) to light grey (indicating a relative sparseness of something). White, or the lack of a symbol, implies the absence of something. Colors can also be used. Generally the colors are arranged in a progression from light to dark. It is best to use colors within the same family, i.e., brown, red, orange, and yellow. Harmonious colors will make the most attractive and readable maps. The areal units used for the choropleth maps can be as large as nations and as small as census blacks within the city.

How to Make a Choropleth Map

1. Determine what areal unit will be used. For this example we will use the 34 census tracts of Waterloo-Cedar Falls community.

2. Select the statistics to be mapped. For this example the percent unemployed by census tract will be used.

3. Since the use of a different symbol for each division would produce a rather busy map, we need to reduce the data or group the statistics into four or five classes. With 34 census traces five classes were used.

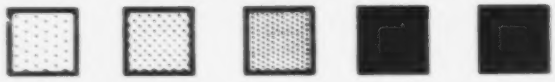
4. Several methods of classification are discussed below.

   (A) Quantile method--This involves dividing the statistics by the number of desired classes such as five (generally 4, 5, or 6 classes are appropriate). With 34 divisions, five classes will suffice (Table I).

   (B) Equal Interval method--Determine the statistical difference percent from the smallest to largest (range). In this example it is about 60 percent. If five classes are used then the classes would be 0-3.4, 3.41-6.8, 6.81-10.2, 10.21-13.6, 13.61-17 (Table I).

   (C) Natural Breaks method--Examine the ranked data and determine if clusters exist. If there are significant separations between the data then put them in a class. This is perhaps the most realistic method in that divisions are not made between statistics that are very similar. Examine the largest gaps between statistics. These will aid you in making your class selection.

5. Symbols--Symbols should be darkest for areas with greater magnitude and the lightest symbol for the least. A suggested scheme would be:



These symbols are easy to draw using pencil, pen, and a ruler. The attached map is the result of the mapping exercise. Note the dissimilarity of patterns.

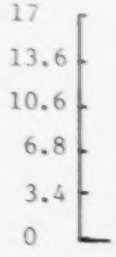
Table I

Percent Unemployed				Per Capita Income			
Census Tracts	Unranked	Census Tracts	Ranked	Census Tracts	Unranked	Census Tracts	Ranked
1	10.5	7	16.5	1	6125	13.02	13330
2	6.6	18	14.6	2	6912	27	11554
3	9.8	17.01	11.9	3	6586	14	11279
4	2.8	5	11.8	4	7535	26.04	11039
5	11.8	17.02	10.7	5	6138	24	10626
7	16.5	1	10.5	7	4497	15.01	10618
8	10.3	8	10.3	8	6475	12	10210
9	8.2	3	9.8	9	6334	25	9364
10	3.5	19	9.4	10	8173	26.03	9236
11	5.5	9	8.2	11	7589	13.01	8792
12	4.6	26.04	6.8	12	10210	15.03	8785
13.01	3.6	2	6.6	13.01	8792	30.01	8722
13.02	2.1	16	6.5	13.02	13330	10	8173
14	2.7	11	5.5	14	11279	22	7862
15.01	4.8	29.1	5.1	15.01	10618	11	7589
15.02	4.8	30.01	5.0	15.02	7207	4	7535
15.03	2.8	15.01	4.8	15.03	8785	30.02	7365
16	6.5	15.02	4.8	16	6647	29.1	7262
17.01	11.9	23	4.8	17.01	5600	15.02	7207
17.02	10.7	12	4.6	17.02	6647	2	6912
18	14.6	26.01	4.2	18	4939	26.01	6868
19	9.4	25	4.2	19	6087	26.04	6726
26.04	1.3	13.01	3.6	26.04	11038	16	6647
27	0.0	22	3.5	27	11554	17.02	6647
29.1	5.1	10	3.5	29.1	7262	3	6586
30.01	5.0	26.03	3.1	30.01	8722	8	6475
30.02	0.0	15.03	2.8	30.02	7365	9	6334
22	3.5	4	2.8	22	7862	5	6138
23	4.8	14	2.7	23	5862	1	6125
24	2.7	24	2.7	24	10626	19	6087
25	4.2	13.02	2.1	25	9364	23	5862
26.01	4.2	26.04	1.3	26.01	6868	17.01	5600
26.03	3.1	27	0.0	26.03	9236	18	4939
26.04	6.8	30.02	0.0	26.04	6726	7	4497

Example--Unemployment by Census Tracts

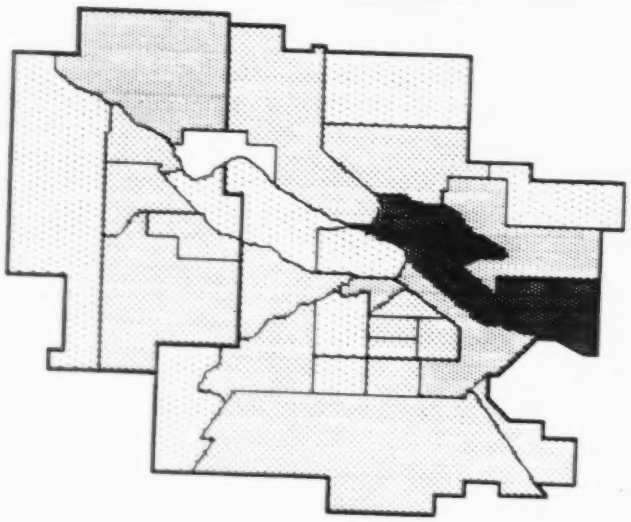
	Quantile	Equal Interval	Natural Breaks
High	7	2	2
Above Average	7	5	7
Medium	6	4	4
Below Average	7	14	18
Low	7	9	3

Equal Interval

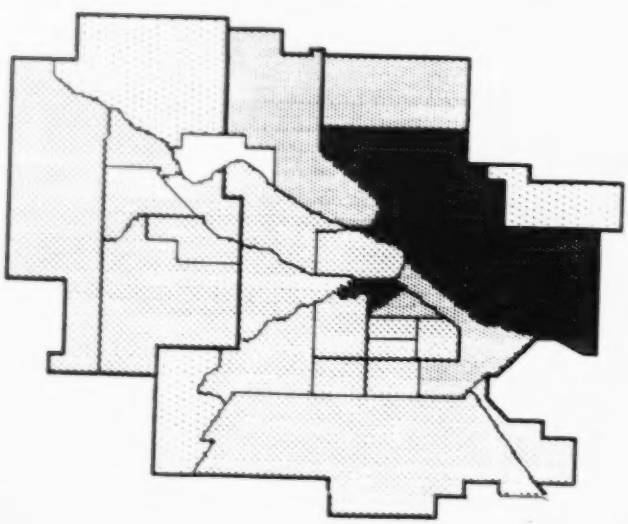


Quantile

Equal Interval



Natural Breaks



SCATTER DIAGRAM

The scattergram or scatter diagram is a device for visually showing the relationship between two variables for a selected number of observations. In this case the number of observations will be the 34 census tracts of Waterloo-Cedar Falls. One variable is measured on horizontal axis and the other on a vertical axis. Where the two lines intersect, a dot is made to indicate the location of that observation unit on the diagram. One advantage the scatter diagram has over map comparisons is that each unit, whether a census tract, county, state, or nation, is reduced to a dot. Often units of unequal size are difficult to compare visually. An example would be comparing Texas and Rhode Island on a United States Map. Census tracts within Waterloo-Cedar Falls also vary greatly in size, an example being census tract 7 and census tract 30.01.

The following is an example of how to construct a scatter diagram of percent unemployment and percent high school graduates.

A. On the attached graph paper draw a vertical and horizontal axis. Start the lines approximately one inch from the bottom of the paper and two inches from the left edge.

B. On the horizontal axis one inch will equal 4 percent unemployment and on the vertical axis one inch will equal 20 percent high school graduates.

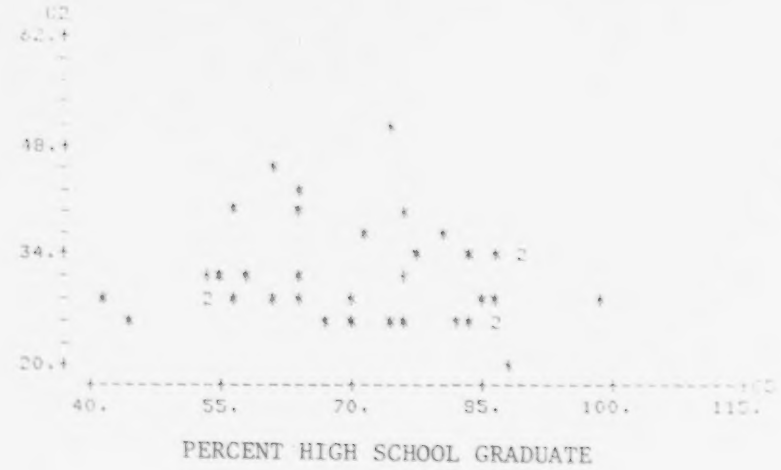
C. Place a dot to represent each of the 34 census tracts.

D. Make sure that the axes are identified (labeled).

E. Interpretation--There are several questions of importance to ask in reading a scattergram. First, do the points tend to be arranged in a sloping straight line? If so, then there is probably an association between the two variables. If the dots are just scattered then there would be a lack of a relationship (Fig. 3A). Second, does the line slope from upper left to lower right? If so you have a negative or indirect relationship (Figure 3C). If the line slopes from lower left to upper right you have a positive or direct relationship (Figure 3B). An example of a positive correlation (relationship) would be the higher the percentage of the population with a high school education the higher the per capita income for that population. Third, do the dots arrange themselves close to the line of the slope? If they do then the greater the strength of the correlation between the variables.

Figure 2

A


MEDIAN AGE
62.
48.
34.
20.
40.
55.
70.
85.
100.
PERCENT HIGH SCHOOL GRADUATE

B

PERCENT HIGH SCHOOL GRADUATE
100.
80.
60.
40.
4000.
6000.
8000.
10000.
12000.
14000.
PER CAPITA INCOME

C

PERCENT HIGH SCHOOL GRADUATE
100.
80.
60.
40.
0.0
4.0
8.0
12.0
16.0
20.0
PERCENT UNEMPLOYMENT

STATISTICAL SOURCES FOR MAPPING LOCAL AREAS

1. Statistical Abstract of the United States, 1985, National Data and Guide to Sources. Bureau of the Census. Paper: Stock No. 003-024-05839-1. $19. Cloth: Stock No. 003-024-05840-5. $23.

2. State and Metropolitan Area Data Book, 1982, A Statistical Abstract Supplement. Bureau of the Census. Paper: Stock No. 003-024-04932-5. $15.

3. County and City Data Book, 1983, A Statistical Abstract Supplement. Bureau of the Census. Cloth: Stock No. 003-024-05833-2. $24.

4. Iowa Agricultural Statistics, 1984, Iowa Dept. of Agriculture, 1985.

5. U.S. Census of Population and Housing, A Standard Metropolitan Area, Census Tract Statistics and Maps. Ref. PhC80-2-112

134	Davenport	334	Sioux City
139	Des Moines	367	Waterloo-Cedar Falls
141	Dubuque	17	Selected Iowa cities
188	Iowa City		

6. U.S. Census of Population and Housing, Standard Metropolitan Area, Block Statistics and Maps.

7. County Board of elections are quite willing to give information on elections and voter registration for city wards and precincts, also county townships.

8. Most police departments have crime zones and available crime statistics for the 8 major reportable crimes (homicide, rape, aggravated assault, robbery, burglary, arson, larceny, and motor vehicle theft).